

Liver Case 3 – Level 1

"Chewie" is a 6-year-old castrated male Bouvier who began showing signs of lameness in the left front limb approximately one month ago. The referring veterinarian initially diagnosed osteochondritis dessicans and prescribed Rimadyl®, a nonsteroidal anti-inflammatory drug. On presentation, Chewie is painful and swollen in the region of his left proximal humerus.

White blood cell count:	5.8 x 10 ⁹ /L	(4.9-16.8)
Segmented neutrophils:	4.1 x 10 ⁹ /L	(2.8-11.5)
Band neutrophils:	0	(0-0.3)
Lymphocytes:	↓ 0.9 x 10 ⁹ /L	(1.0-4.8)
Monocytes:	0.6 x 10 ⁹ /L	(0.1-1.5)
Eosinophils:	↑ 0.2 x 10 ⁹ /L	(0-0.1)
WBC Morphology: Appears within normal limits		

Hematocrit:	48%	(39-55)
Red blood cell count:	7.78 x 10 ¹² /L	(5.8-8.5)
Hemoglobin:	16.7 g/dl	(14.0-19.1)
MCV:	60.9 fl	(60.0-75.0)
MCHC:	34.8 g/dl	(33.0-36.0)
RBC morphology: Appears within normal limits		
Platelets: Appear adequate in number		

Glucose:	99 mg/dl	(67.0-135.0)
BUN:	13 mg/dl	(8-29)
Creatinine:	1.2 mg/dl	(0.6-2.0)
Phosphorus:	3.9 mg/dl	(2.6-7.2)
Calcium:	11.1 mg/dl	(9.4-11.6)
Magnesium:	2.3 mEq/L	(1.7-2.5)
Total Protein:	6.8 g/dl	(5.5-7.8)
Albumin:	3.3 g/dl	(2.8-4.0)
Globulin:	3.5 g/dl	(2.3-4.2)
A/G ratio:	0.9	(0.7-2.1)
Sodium:	148 mEq/L	(142-163)
Chloride:	114 mEq/L	(106-126)
Potassium:	4.4 mEq/L	(3.8-5.4)
HCO ₃ :	15 mEq/L	(15-28)
Anion Gap:	19	(8-19)
Total Bili:	0.20 mg/dl	(0.10-0.30)
ALP:	↑ 345 IU/L	(12-121)
GGT:	4 IU/L	(2-10)
ALT:	59 IU/L	(18-86)
AST:	27 IU/L	(16-54)
Cholesterol:	243 mg/dl	(82-355)
Triglycerides:	71 mg/dl	(30-321)
Amylase:	1200 IU/L	(409-1203)

Interpretation

CBC: The mild changes in lymphocyte and eosinophil numbers may be a normal variation. Lymphopenia may be secondary to endogenous corticosteroid release or stress. However, the presence of a mild eosinophilia makes a steroid response less likely. Increases in eosinophils may be seen with parasitic disease or hypersensitivity reactions. The remainder of the CBC appears within normal limits.

Increased ALP (2.5x): This relatively mild elevation in ALP is quite nonspecific by itself. Due to the numerous causes for increased ALP in the dog, interpretation is heavily dependent on clinical information. *In the context of Chewie's history and physical examination findings, increased ALP due to bone disease seems likely.* While osteomyelitis is a possibility, so is osteosarcoma. As always, the possibility of endocrine disorders and exposure to medications that could induce increased ALP expression should be ruled out.

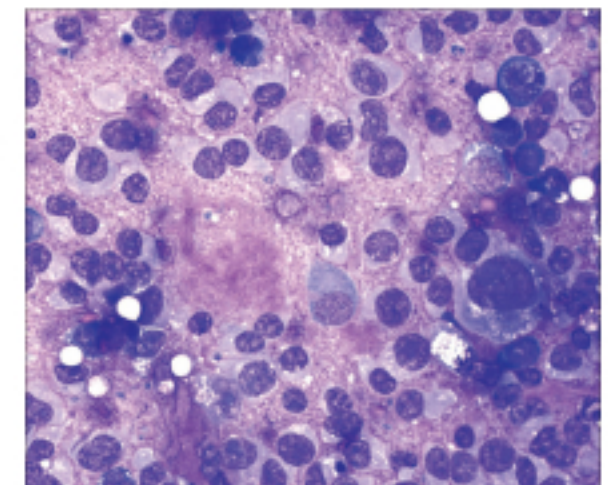
Case Summary and Outcome

Increased ALP secondary to bone disease

In contrast to Spunky (Liver Case 1), Chewie is too old to expect ALP to be elevated due to normal skeletal growth. No medications that could induce ALP were given. While a lymphopenia may support a corticosteroid response, the lymphopenia observed in Chewie is very mild and the rest of the CBC is not consistent with a stress or "steroid" leukogram. While Rimadyl® has been reported to cause liver failure in some dogs, this is associated with jaundice and elevations of not only ALP but also ALT and AST, which were not present in this patient.

Radiographs demonstrated a lytic lesion in the proximal humerus, however thoracic films were clear of evidence of metastatic disease. Please note that this does not rule out the presence of microscopic metastases, which are often present at the time of diagnosis of osteosarcoma (Figure 2-1). Cytologic evaluation of aspirates from the lytic lesion (Figure 2.1) were consistent with osteosarcoma. (Most cells) Chewie's limb was amputated, and biopsy showed osteosarcoma with areas of necrosis and hemorrhage. Dogs with osteosarcoma have shorter survival times and disease free intervals if the serum ALP is elevated at the time of diagnosis (Ehrhart, Kirpensteijn, Liptak). In this case, the serum biochemical profile helped support the clinical diagnosis and provided additional prognostic information.

Figure 2-1 Smears consisted of numerous round to oval to spindle shaped mesenchymal cells with abundant pale blue cytoplasm. Most cells had a single round to oval nucleus that was often eccentrically placed consistent with neoplastic osteoblasts. Features of malignancy such as anisocytosis and anisokaryosis were marked. Bright pink extracellular material compatible with osteoid was noted.



Ehrhart N, Demell WS, Hoffmann WE, Weigel RM, Powers B, Withrow SJ. J Vet Med Assoc. 1998;213:1002-1006.

Kirpensteijn J, Kik M, Rutteman GR, Teske E. Prognostic significance of a new histological grading system for osteosarcoma. Vet Pathol. 2002;39:240-246.

Liptak JM, Dernel WS, Ehrhart N, Withrow SJ. Canine appendicular osteosarcoma: diagnosis and palliative treatment. Comp Contin Ed. 2004;26:172-196.